Osteoarthritis of the distal intertarsal (DIT) and tarsometatarsal (TMT) joints is a common cause of performance limiting hind limb lameness in all types of equine athletes. It is particularly prevalent in western performance horses, and horses that work at a collected gait. These types of athletic performance result in repetitive compression, torsion, and shear strains on the lower hock joints, which leads to the development of osteoarthritis. Some horses are predisposed to osteoarthritis as the result of osteochondrosis (juvenile spavin), articular fracture, or traumatic joint or peri-articular ligament injury. Osteoarthritis of the DIT and TMT joints can be suspected based on the history and lameness examination. Definitive diagnosis relies on observing improvement in lameness following intra-articular anesthesia of the DIT and TMT joints or hock radiographs demonstrating signs of osteoarthritis including peri-articular osteophytes, subchondral bone lysis, subchondral bone sclerosis, joint narrowing and ankylosis.

Medical management remains the best therapeutic option for osteoarthritis of the distal hock joints. Intra-articular hyaluronan and cortisone, and systemic non-steroidal anti-inflammatories will allow most horses to continue in training and performance. Some horses however, do not respond well to injections, or have only a short duration of response to the injections. These horses may be candidates for facilitated ankylosis of the lower hock joints.

Surgical arthrodesis of a joint requires removal of the articular cartilage and stabilization of the joint. In the case of the lower hock joints, our aim is to facilitate ankylosis by removal of articular cartilage, but utilizing the peri-articular ligaments to stabilize the joints. Multiple techniques have been developed to facilitate ankylosis of the distal two tarsal joints in horses. These techniques utilize different methods of articular cartilage destruction. Current techniques being utilized include; surgical drilling (SD), sodium monooiodoacetate (MIA) injection, laser surgery, and ethyl alcohol injection of the distal hock joints. A retrospective study evaluating the use of SD, reported that 59% of the horses returned to their previous level of athletic performance. Clinical success using MIA to facilitate ankylosis has varied from 40 to 90% in performance horses. Laser facilitated ankylosis, using a Nd:YAG or diode laser, has a reported clinical success of up to 90%. Long term clinical results of ethyl alcohol injections for treatment of osteoarthritis of the distal hock joints has been shown to result in a 52-86% success rate. Many horses in these clinical studies evaluating ethyl alcohol, had communication between the lower hock joints. One retrospective study of ethyl alcohol injection also revealed that 8 horses had a deterioration in the lameness following the procedure. The technique has also successfully created areas of fusion of the TMT joint in normal horses. The last two techniques result in minimal pain following treatment, and have a shorter period of convalescence compared to other methods of facilitated ankylosis.

Laser facilitated ankylosis is performed under general anesthesia with the horse in dorsal recumbency. The distal tarsus is prepared and draped for aseptic surgery. A18-gauge, 1½-inch needles are placed in each DIT and TMT joint on the medial, dorsal, and lateral side. Needle position is confirmed with radiographs or fluoroscopy. Each needle will serve as a site for introduction of the laser fiber and as a vent for plume evacuation during the application of laser energy to the joints. A 600 micron contact laser fiber is inserted through the needle; and the laser fiber and needle are advanced across the joint as the laser was activated. Approximately 1200 joules of laser energy is applied to each joint divided between 3 or 4 sites for each joint.
Needles are cooled by irrigation with chilled saline during the procedure. Skin incisions are not closed. The distal tarsus is placed in a sterile adhesive bandage. In some horses with more severe ankylosis it is necessary to perform the lasering at multiple locations around the joint through stab incisions and drilling of a 2.5mm pilot hole into the joint. This allows introduction of the laser fiber through areas of natural ankylosis.

Surgical drilling is performed under general anesthesia with the horse in dorsal recumbency. The distal tarsus is prepared and draped for aseptic surgery. The cunean tendon is identified by palpation. A 30 mm vertical skin incision is made over the distal 2 tarsal joints on the medial side of the tarsus using a #10 scalpel blade, distal to the cunean tendon. A 20-gauge, 1-inch needle is then inserted into the DIT and TMT joints. The position of the needle within the joint is confirmed with fluoroscopy. A 3.2 mm drill bit is then passed into each joint and placement of the drill is again confirmed with fluoroscopy. A 4.5 mm drill bit is then used to create 3 drill holes across each joint in a diverging pattern. The incision is closed routinely in 2 layers. The distal tarsus was placed in a sterile adhesive bandage.

Injection of ethyl alcohol can performed standing or under general anesthesia to ensure precise needle placement. The distal tarsus is aseptically prepared. A 22-gauge, 1-inch needle is inserted into the TMT joint, proximal to the fourth metatarsal bone and directed distal-medially at a 45 degree angle. A 22-gauge, 1-inch needle is inserted into the DIT joint at the junction of the fused first/second, third, and central tarsal bones on the medial side of the tarsus, distal to the cunean tendon. Confirmation of needle placement is made by retrieval of synovial fluid or radiography. Each joint is injected with 2.5 mls ethyl alcohol qs to 3 mls with sterile saline that has been aspirated through a 0.22 μm filter to eliminate bacteria. It is important that the ethyl alcohol is diluted to 70%, as higher concentrations appear to decrease efficacy. Laboratory grade ethyl alcohol is the preferred solution for intra-articular injection.

Although it is no longer commonly utilized, injection of MIA is performed under general anesthesia to ensure precise needle placement. The distal tarsus is aseptically prepared. A 22-gauge, 1-inch needle is inserted into the TMT joint, proximal to the fourth metatarsal bone and directed distal-medially at a 45 degree angle. A 22-gauge, 1-inch needle is inserted into the DIT joint at the junction of the fused first/second, third, and central tarsal bones on the medial side of the tarsus, distal to the cunean tendon. Confirmation of needle placement is made by retrieval of synovial fluid or radiography. Each joint is injected with 100 mg sodium monoiodoacetate diluted in 2 mls saline that has been aspirated through a 0.22 μm filter to eliminate bacteria. It is important that these horses are treated aggressively with analgesics before and in the immediate post treatment period.

Some level of forced exercise is necessary with each of these techniques in order to encourage ankylosis. This is probably most important with laser surgery and ethyl alcohol injection, and easiest to accomplish due to the level of comfort in these horses.

A comparative study has been performed in sound, radiographically normal, horses comparing diode laser surgery, to SD and MIA injection of the DIT and TMT joints. Group 1 (n = 6) had laser surgery performed on the DIT and TMT joints of 1 tarsus and MIA injection of the contralateral joints; and group 2 (n = 6) had laser surgery performed on the DIT and TMT joints of 1 tarsus and SD of the contralateral joints. The study evaluated post-operative comfort, lameness, and amount and quality of joint fusion based on radiographs, microradiographs, and histology. Laser surgery produced the least morbidity in the immediate post-operative period. Most horses were less lame in the laser surgery treated limb, compared to the MIA treated limb at 6 months, and compared to the SD treated limb at 6 and 12 months. Microradiographs
revealed that MIA resulted in more bone bridging than laser surgery at 6 months, and surgical drilling resulted in more bone bridging the joint at 12 months, than laser surgery. Significantly more of joint space was bridged by bone in the MIA and SD treated joints, compared to the laser surgery treated joints at 6 and 12 months, respectively.

Ethyl alcohol injection of the TMT joint has been evaluated for performing facilitated ankylosis. The injection ethyl alcohol resulted in areas of articular cartilage degeneration, followed by localized areas of mature osteonal bone bridging. The horses in this study had sporadic episodes of mild lameness during the study. The facilitated ankylosis occurred over 4 months, however the fusion was concentrated in the area of the injection site, including the area between the third tarsal bone, fourth tarsal bone, third metatarsal bone and fourth metatarsal bone, as well as in the areas of the intertarsal ligaments and joint capsule. Clinical cases of osteoarthritis have been treated following contrast arthrography. These horses did not appear to as much radiographic evidence of joint fusion as normal horses following ethyl alcohol injection. For unknown reasons, clinical cases with osteoarthritis of both joints had resolution of the lameness even when only the TMT joint was treated. There are reports of increased lameness, and development of osteoarthritis in the proximal intertarsal and tarsocrural joints, even after contrast arthrography did not reveal communication with these joints.

Horses treated with laser surgery and ethyl alcohol may be more comfortable and less lame because less damage was done to the joints compared to the other 2 treatments. It is also likely that laser surgery and ethyl alcohol cause damage to nerve endings in the subchondral bone, synovium, and joint capsule, which can result in decreased pain perception in horses following these treatments.

Each of the techniques currently used to facilitate ankylosis of the distal two tarsal joints in horses has distinct advantages and disadvantages based on the individual case, and the degree of osteoarthritis that is present at the time of treatment. Horses that have minimal joint narrowing, subchondral bone lysis and sclerosis, and minimal natural ankylosis, appear to be the best candidates for treatments that involve joint injection including MIA and ethyl alcohol. Horses amendable to treatment with these products need to have joints that are amendable to easy injection of 3 mls. This is necessary to ensure distribution throughout the joints, and prevent leakage into the surrounding soft tissues. Additionally, distribution of these products through joint communication into the tarsocrural joint can occur, resulting in catastrophic destruction of a high motion joint. Although this is uncommon, it is a potential risk associated with the procedure that must be considered. These two techniques have the distinct advantage that they require minimal special equipment or training in order to be performed. MIA injection can result in substantial short-term soreness, which is not seen with ethyl alcohol. Horses having laser surgery or ethyl alcohol treatment of the DIT and TMT joints have minimal post-treatment pain, minimal lameness and a short convalescent period. Neither treatment appears to result in wide spread bone fusion, however this may not be necessary or desirable to achieve long term soundness. Laser surgery, MIA and ethyl alcohol injection can be difficult to perform in horses with substantial osteoarthritis of the distal two tarsal joints. This can be overcome with the laser surgery technique by performing the technique through multiple different portals, or predrilling the portal for laser fiber insertion using a 2.5 mm drill bit. Surgical drilling can be performed in horses with substantial osteoarthritis of the distal two tarsal joints, however the technique can result in moderate post-operative pain and lameness, and a prolonged convalescent period.
Each of the four techniques currently used for facilitated ankylosis of the DIT and TMT joints in horses has its’ own set of advantages and disadvantages. The radiographic appearance of the joints and the horses anticipated performance schedule must be considered when determining which technique is most appropriate to perform on a horse with osteoarthritis of the DIT and TMT joints. The best technique can vary with each individual case and each surgeon’s experiences. With modifications in certain cases, laser surgery is probably the most versatile technique to perform, and is likely to have a good prognosis for soundness and a short convalescent period. The other techniques can also result in a successful outcome when performed correctly on appropriate cases.

References